

These are some of the helps that an appropriation would place in our hands.

Iowa annually gives her Horticultural Society \$1,000; Illinois \$4,000; Michigan \$2,500.

Minnesota has purchased 116 acres of land, and appropriated \$1,000 annually, for the purpose of originating, testing and disseminating trees and fruits especially adapted to her wants.

These are the views, and this the action of our four surrounding sister states. It only remains for us to fall hopelessly behind, or to ask for and receive aid at your hands; consequently we make this request with enthusiastic love and zeal for our calling, with full belief that our state resources and interests are *second to none*, and that every dollar expended will return to her an hundred fold.

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## INSECTS INJURIOUS TO THE APPLE AND GRAPE.

DR. P. H. HOY, RACINE.

### *Officers and Members of the Wisconsin Horticultural Society:*

I come before you by invitation to speak of some of those insects that are injurious to agriculture and horticulture, more especially those infesting the apple and grape. I shall speak only of those insects which I have in these cases before me, brought that you might examine them at your pleasure.

Although good engravings are of great value, yet, if they were ever so accurately executed, they would still fall far short of the reality. I, therefore, will not describe the perfect insect, but call your attention to these specimens, which are conspicuously labeled and so arranged that you can distinguish them at a glance.

### FOES TO APPLE.

The American Lappet Moth, *Gastropacha Americana*. The food plant of this moth is the apple tree, on the leaves of which the larvæ feed. Where the eggs are deposited, and just how long they exist in the larval state, is unknown. The life history of this moth remains to be studied. The caterpillar, when fully grown, measures two and a half by one-half inches. The upper part is gray, variegated by irregular white spots, and ornamented with

two conspicuous scarlet bands on the second and third rings, and on each of these bands there is a black dot. They have warts projecting from their sides, covered with gray hairs, some of which are tipped with white knobs. These hairy lateral warts look somewhat like lappets, hence the name Lappet moth. The underside of the worm is ornamented with a row of diamond shaped black spots. These caterpillars feed only at night and remain at rest during the day, stretched out on the limbs motionless, in which position they are hard to see. The moth which I exhibit is a male; the female is at least twice as large. This is a rare insect in the eastern states, but if I am not greatly mistaken, it will prove to be entirely too abundant in Wisconsin.

The apple tree Tent moth, *Clisocampa Americana*. The Tent caterpillar is so well known that a description is hardly necessary. The shining tent, constructed by the united labor of all, is so conspicuous that no one is deserving of pity who will permit his orchard to be overrun and destroyed by these pests. A light step-ladder and a stout pair of gloves are the best implements to combat this enemy. Before nine in the morning or after four in the afternoon, you will always find them at home snugly housed, or rather tented. The eggs, deposited near the end of the small branches, are so easy to see, that with care, any time in the winter or early spring, these egg masses can be gathered and destroyed, thus nipping them literally in the bud. I exhibit the egg masses; they contain from 300 to 400 eggs each.

There is another closely allied species — *Clisocampa Sylvatica* — which is generally confined to the forest, yet, in exceptional cases, they have been found in the orchard. This species can readily be known by the dorsal stripe on the caterpillar. This stripe is continuous, of uniform width, while in the forest species each ring has an exclamation point on it, or as one has said, a "ten pin." Perhaps the individual was more familiar with ten pins than the more literary character. Harris, Fitch and Riley may be consulted for a more detailed description.

We have two species of canker-worm infesting the apple tree — the fall canker-worm, *Anisopteryx autumnata*, and the spring canker-worm, *Anisopteryx vernata*. These two species of geometers do great damage to our apple orchards. The females are without wings and hence we have more control over them. Not

only the vernal species come out in the spring, but numbers of the autumnal species are delayed till the warm days in March or the first of April. The larva is a ten-legged looper, pale green to brown, with narrow stripes of yellow. All we have to do to control these canker-worms is to devise means to prevent the female from crawling up the trunks of the trees to deposit her eggs. Many devices have been invented, and many of these, if used understandingly, will prove successful.

As all these worms must go into the ground in order to undergo their metamorphosis, and as the female is wingless, we can have perfect control of them. Adhesive mixtures put on the trunks, wisps of cotton batting or any other fine fibrous substance suitable to entrap these creeping nuisances, will generally be effective.

The yellow-necked apple-tree worm, *Datana ministra*. Few worms excite more alarm than do these large caterpillars, as they live together in families. They commence eating at the extremity of the branch and devour every green thing as they descend. When feeding, they huddle together on the under surface of the leaves, with their heads all one way. The moth begins to appear the last of July. The eggs are deposited in one pack on the under side of the leaf. The larvæ are plump and covered with soft hairs. The first segment (neck) is marked with a pale yellow band. The upper side of the worm has narrow double dorsal and four narrow lateral cream colored stripes; head black, without spots. The yellow neck will sufficiently distinguish these large worms. May their number be small.

Tussock Moth, *Orygia leucostigma*. During the winter little bunches of dead leaves are frequently seen fastened together on our orchard trees, apple, etc. These are the cocoons having egg masses fastened to their sides. These eggs hatch about the middle of May and the curiously beautiful tufted caterpillar commences his work, never in company, singly, but never profitably to the horticulturist. The larva is ornamented with four dorsal tufts on the third, fourth, fifth and sixth rings. A single bunch of long black graduated hairs spring from the tail and two similar ones from the first segment. On each side there is a series of colored spots ornamented with hairs. Those worms that are to produce females go through one more molt than those that are destined to produce males. Although the females are without wings, we have

not quite so much control as we would if the transformation took place in the ground. Still, with care in destroying the eggs, we may limit their injury within reasonable bounds.

*Catocala nuptalis* and *catocala ultronia*. I have found the larvæ of these two species of catocalas on the apple tree. I never caught them feeding, hence I suppose they feed only at night. These caterpillars stretched out at full length, resemble so closely the twigs to which they adhere, that it is extremely difficult to see them. We have taken at Racine 43 species of these large showy noctuidæ. They feed on the leaves of various trees, hickory, oak, willow, poplar, etc.

Codling moth, *Carpocapsa pomonella*. So much has been written about the life history of this destroyer of the democratic apple that I will only refer you to the writings of Harris, Fitch and Riley for any wished for information.

Apple leaf crumpler, *Phloxopteris nubeculana*. This specie of Tortrix proves to be a serious pest in many sections, and from their small size and the manner of their operations we have less control than over larger and more conspicuous insects. Each worm works for himself, sews two or three leaves together to serve as a protection against enemies; but although alone, there are quite enough neighbors close by. It is generally true that the smaller the insect, the more the injury. They make up in numbers what they lack in size. There are several other species of *Tortricidæ* found in the orchard, but their injury is of small account when compared with the leaf roller. I intend to study this insect carefully, and experiment with various devices looking to their destruction.

The apple tree borer, *Saperda bivittata*. It is a fortunate thing that this borer should be so rare in Wisconsin. It belongs to the longicorn beetles, all of which bore into trees and shrubs, or rather the larvæ do. You all know the locust clytus that has nearly exterminated this tree at Racine at least.

I have 50 species of these capricorn beetles, all taken in Wisconsin. One of the handsomest of these insects is the *maple borer*.

New York curculio, *Ithycerus noveboracensis*. This large species of curculio does not escape the bad reputation of the entire family. Some years this insect is quite numerous, doing considerable damage to young apple trees. They girdle the small branches at night and hide away under clods and rubbish near the foot of the tree

during the day. I have had many letters with specimens of this, sent for information. Last fall, just at twilight, I discovered a New York curculio at her work. I watched her till she had completely girdled the terminal shoot of a young apple tree.

In this connection I will call your attention to the plum curculio. There are many species of curculio, all more or less injurious, but this rascal bears off the palm. There were none at Racine previous to 1856.

*Bupestris femorata*. This works not a little injury to the apple. The Bupestridæ are borers, but they always select a spot where the bark is slightly loose, in the crevices of which they deposit their eggs. The young, when hatched, soon penetrate the wood and live there during their larval state. Apple trees are so weakened by their perforations, that they soon yield to the wind. If the decay hastened by these insects does not prove fatal to the tree it affords a happy hunting ground where hundreds of Bupestridæ join forces. Union is strength, but not for the poor tree, which soon succumbs to numbers. Many apple trees are lost, the owner having no idea of the cause. A little Paris green might save the trees if properly used.

The gray Xylina, *Xylina cinera*, appears to be a general feeder. It is frequently found on the apple tree according to Riley, who first described the abundant western species. It not frequently bores into the fruit; apple, plum, peach, etc. The larvæ may be known by a narrow dorsal and a wide lateral colored stripe, color shining green. This species may prove decidedly injurious to Wisconsin.

The Dagger moth, *acronyctia*. The larvæ may readily be known by their long, soft, light colored hairs that project directly from the body, and about five long, black pointed tufts which project outwards, somewhat like daggers—hence the name. The species which I bring is the *acronyctia superans*. I have repeatedly taken this species in orchards, and I am not without suspicion that the larvæ feed on the apple.

#### FOES OF GRAPE.

*Eudryas grata* and *unio*. Two species of wood-nymphs and the spotted forester, *Alypia octomaculata*, feed upon the grape,



and it takes more than a superficial examination to detect a difference in the larvæ. These are known as blue caterpillars. They have four to six transverse black stripes on each segment, resemble somewhat the larvæ of the Sphingidæ, in fact they were included in this group by the older entomologists. Now they are placed in the small group Zyganidæ. Grape leaf crumpler, *Desmia maculata*, is a great pest in the vinery. With me it has been more numerous in the cold grapery. They sew together grape leaves and have the general habits of the leaf eating *Tortricidæ*. The larvæ are pale green, marked with transverse wrinkles.

*Petrofora diversilineata*. A rather handsome geometer that has given me much trouble not only with my hardy grapes but particularly in the cold grapery — under glass. The larvæ when at rest during the day, stand stretched up at about the same angle of the branches and leaves; this together with the fact that in color and general appearance they closely resemble the branch or leaf on which they are fixed, makes an experienced as well as sharp eye necessary to detect them. I fear this insect is likely to prove a great pest in this state.

The arctias is represented by *Arctia Isabellæ*. The larvæ of the arctia are called hedge-hog caterpillars. They are entirely covered with bunches of rather stiff hairs. These hairs are black, for one-fourth at each end, and bay in the middle of the body. They feed mostly on herbaceous plants, but frequently ascend grape vines and make themselves at home to our cost.

The Virgin moth, *Spilosoma Virginica*. The larva of this moth is known as the yellow bear. They are a general feeder but have a partiality for the grape. They appear to like the warm sunshine of the cold grapery. They deposit their eggs on the under side of the leaves, and in a few days a host of little hairy caterpillars are feeding as if their lives depended on making good time.

*Drapsia Miron*. This species of sphinx, one of our worst enemies, selects the grape as the food plant for their young. The larvæ have a well defined caudal horn.

*Thyrens Abottii* is also a grape feeder. The larva has an eye-like spot on the rump in place of the usual horn of most of the Sphingidæ.

*Philampelius pandorus* and *P. achemon* usually prefer the ampelopsis, but by no means despise the grape. I have known them to strip a grape vine of its leaves in a few days. They can

be detected in their work if we heed the castings which are conspicuous under the infested vine.

The Bee moth, *Gellerea cereana*. Too well known wherever the bee is propagated. I need not describe.

Bee killer, *Trupanea apivora*. This species of the Asalæ family preys on various insects. This species is rather fond of bees. This one captured a bee that was quietly sucking a white clover blossom. The killer seized the bee by the neck and by elevating the abdomen kept clear of the bee's business end. The struggle was short. The head of the bee was severed and the body quietly devoured. I noticed that the honey stomach was a tid bit to this hairy murderer.

The Gooseberry moth, *Euphanera mendica*. This moth feeds principally on the leaves of the wild gooseberry, but I have known them to infest Houghton seedling.

*Synchlora rubivoraria*. This little pale-green geometer is the parent of the raspberry worm, so annoying to the lovers of this excellent fruit. The larvæ attach particles of the fruit to their bodies and rolled up in a ball exceedingly hard to see. Without the greatest care we are in danger of eating these disgusting worms with our dessert.

I have here two species of *Pieris*, *P. protodice* and *P. oleracea*. The protodice has a bad record with the growers of cabbage. The larva may be described as a soft bluish-green worm with four longitudinal yellow stripes. Length one and one-fourth inches. The sixth, seventh and eighth ring are largest, giving the worm a fusiform shape.

*Pieris oleracea* is abundant at Racine, occurs but little south. The first made their appearance at Racine in 1855, since which time they have greatly increased. The larvæ feed on almost any crucifera. Mustard is a favorite food plant. The turnip suffers considerably from this pest. The larva resembles the protodice, but is lighter colored.

*Plusia brassicæ* does some damage to the cabbage, still it is quite a general feeder. I have seen it on the tomato. The larvæ are pale-green and almost diaphanous. They are tender and can be destroyed easily, but it takes sharp eyes to see them.

Cabbage tenia, *Pleutella limbipenella*, is small in size but large in damage. Cabbage infested by the larvæ of this small tenia look

as if riddled by shot. It has cost hundreds of dollars in the vicinity of Racine. There is another pest of the cabbage belonging to Diptera, *Anthomyia brassicæ*, the maggot of which eat the stalk and root, utterly destroying them. Cabbage cut worm, *Agrotis saucia*, destroys cabbage by the wholesale.

The history of insects, their metamorphosis, habits, relation to plants, etc., is a branch of natural history which has peculiar claims on agriculture and horticulture. In view of the millions of dollars annually lost to the state by the depredations of insects, it becomes an interesting problem how to distinguish in all stages of growth our insect friends from our insect foes, that we may be better fitted to protect the one and destroy the other. We are literally at the mercy of insects. Wisconsin can ill afford to do without the valuable services of an energetic, capable state entomologist.

We have a host of insects peculiarly destructive, waiting for careful study, the better to enable us to counteract their evil work. Not the least of the advantages to be derived from the labors of an active, enthusiastic entomologist, is the education of farmers and their families by personal acquaintance. Children would soon learn to see, with their young eyes, what the older ones overlook, and just here is important matter of education. I am convinced that children should be taught natural history as one of the primary branches. I would not have them study printed books, but go to the source where the most valuable information is derived — from the book of Nature, whose pages are ever open wide to the seeker after knowledge.

It is a disgrace that the agricultural interest of the state, which is the foundation of national prosperity, should be so shamefully neglected under the pretext of economy. If an individual owned and cultivated a single township of land, it would be to his interest to employ constantly an entomologist. It can be proven that the money expended for this purpose would return an hundred fold.

The present population of Wisconsin is at least 1,250,000; \$3,000 would pay an entomologist. This amount would be less than one-fourth of one cent for each; some of the rich might have to pay ten cents. How frightful this amount looks!

The agricultural and horticultural interests of the state demand more attention and better representation. If our merchants lost a fraction of what our farmers annually lose by insect depredations



alone, they would immediately seek and undoubtedly obtain adequate protection for the reason that they are united, and would see to it that the relief be granted. Let the farmers unite and their interests also will be looked after.

Mr. Peffer — Have you the blue grape beetle? It is a kind of a flea beetle that attacks the grape vine in the spring, eating the buds.

Dr. Hoy — I have not. There are three or four kinds of these little insects, but I have not specimens with me, and thought best not to say anything about them, not being able to show the insects.

Mr. Peffer — They have done more injury to my grapes this spring than ever before. I believe I was the first one that sent them to an entomologist, and that was, I think, twenty years ago.

Mr. Plumb — Some of the gentlemen present have been examining this model of a curculio catcher that was sent here. Give us your opinion on that.

Dr. Hoy — The curculios can fly as well as a bird, and no curculio catcher of this kind will prevent their getting on the trees at all. They raise their hard wings and unfold beautiful little membranous wings under them. Any device of this kind only shows the ignorance of the designer.

Mr. Plumb — I brought this up because the designer of this catcher is a very intelligent man and is laboring under a great mistake. He sent this model to explain his theory of preventing the curculio beetle getting on to the plum trees to deposit its eggs.

Dr. Hoy — He has seen the curculio but has not been able to see its wings; but neither can he see the wings of any of the beetles. They can fly as well as a bird. The curculio never crawls up the tree; he flies up.

Mr. Robbins — I feel very much interested in this lecture on entomology. It strikes me very forcibly. I know the fellows now that do the damage. Now the question is, what am I going to do about it. I do not want any of those animals let loose in my neighborhood.

Dr. Hoy — I have got them under glass.

Mr. Robbins — I want him to kill every one he gets hold of. I have a few apples and grapes and raspberries and blackberries. I do not want any of those animals let loose among them. I am like the boy that was bit by a chipmunk. Says he, "I am glad you bit

me because now I know where you are." I know their names now. I have learned that much. But the question is, what am I going to do about it?

Dr. Hoy — I will ask any gentlemen present to send me any worms that they find injuring their crops or the forests about them. Put them into a little tight box. There is no necessity for any holes. Put in some of the plant or the leaves you find them on. Holes are of no use, but are injurious because of the evaporation of the plant. The insects would be very easily destroyed if they were so tender you had to furnish them air, but they are very tenacious of life.

Mr. Robbins — How are we going to kill them? That is the question.

Dr. Hoy — That is a question the farmers ought to be better instructed upon. We must understand their habits before we can manage them. We see such ignorance as that "catcher," thinking the curculio climb up the tree. If that was so we would have saved our plums long ago.

Mr. Robbins — He thinks he has found out how.

Dr. Hoy — There is that difference between wisdom and happiness. The man that thinks himself the happiest is the happiest, but the man that thinks himself the wisest is not always so. In sending insects put them in boxes and tie with a string, and mark on the outside "Samples of Natural History." The postage only costs a cent an ounce. A cent will pay for a pretty good lot of worms. Address "Dr. P. R. Hoy, Sr.," Racine, Wis., for there are two Dr. Hoy's in Racine. I will be very happy to correspond with you and give information, and answer such questions as you may propound. I think in a great many instances people have been destroying their best friends, supposing them to be enemies. A man in Racine went to my son and told him his plum trees were overrun with a sort of bug or worm that runs upon the bark; he had killed thousands and thousands of them. He told me, and I said "They may be beneficial to your plum trees." He brought some to me, and they were the young of what is called the "lady-bug." The trees had been infested with plant-lice, and they had been up and entirely destroyed the plant-lice and came down on the body preparatory to undergoing the change to come out as those beauti-

ful little beetles, our best friends. That is the way he rewarded them for their services.

Mr. Kellogg — I am glad to have this subject so well simplified as we have to-day. I think it is the finest entomological talk we have ever had. It brings the matter right before us in common language. I wish you would describe the lady-bug as it is before it gets to be a lady-bug, so we will not destroy it. As to the box you speak of, will any little pasteboard box do to send specimens in?

Dr. Hoy — The pasteboard box is not very good. They used to make a kind of matchbox of wood which is good. The pasteboard box is apt to get mashed up. A small tin box is good.

Mr. Kellogg — I want to ask the best methods, or whether there is any way to catch the codling moth by sweetened water or vinegar, or in any way.

Dr. Hoy — A great many insects can be caught in large quantities by taking stale beer and sugar, and plastering it upon the side of the tree; just after night if you go there, the tree will be perfectly covered with them, and you can destroy them; by killing the parents you very frequently prevent the propagation of the insects.

Mr. Plumb — The greatest terror there is to the apple tree planter, as a member of the assembly from Green county told me last evening, is the canker worm. He said they were sweeping all through the township where he lives. Said I, "Don't you know it is easier to destroy them than it is the potato bug?" No, he did not know anything about it. Everywhere I go I find people who are letting the canker work sweep over their orchards, destroying thousands and tens of thousands of dollars worth of valuable property, when they are much easier destroyed with Paris green or arsenic than the potato bug is. One pound of arsenic which can be bought for five cents, will poison eighty gallons of water, that can be distributed with very little labor over an orchard. Two or three cents worth of that poisoned water thrown from a force pump will completely eradicate the canker worm, in its earliest stages, from a tree able to bear eight or ten bushels of apples. It is a practical remedy. It has been told here before, and yet people do not know it. Now the question with me is, how far can we go with these poisonous remedies. That is to me a subject of grave

inquiry. I am glad we have had so much entomology; we could easily spend the whole forenoon on this subject.

Prof. Daniells — I would like to inquire if that solution would kill the curculio on the plum.

Dr. Hoy — It would be dangerous to the plum, for the poison would be on the plum. It does not hurt the tree or the foliage.

Prof. Daniells — It has been suggested to sprinkle the foliage when it was wet, with Paris green and flour.

Dr. Hoy — There is no trouble about that. There is no danger whatever.

On motion of Mr. Kellogg, the thanks of the convention were given to Dr. Hoy for his able presentation of the subject of entomology.

Mr. Phillips then offered the following resolution:

WHEREAS, Destructive insects seem to be increasing throughout the state and promise to be more annoying to horticulturists in the future than in the past; and,

WHEREAS, It is desirable that information upon this subject be placed within the reach of the largest number possible the coming season; and,

WHEREAS, The press of the state is the most efficient and practical remedy for the purpose; therefore,

*Resolved*, That the secretary of the Horticultural Society be instructed to prepare at the proper time, short, practical directions for preventing the ravages and the increase of destructive insects, and present it to the press, with the request of the society that all state papers will copy.

The resolution was adopted.

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## TRAINING AND PRUNING THE GRAPE VINE.

C. H. GREENMAN, WAUWATOSA.

President Smith requested me to prepare a paper for the summer meeting, on "Grapes for the common farmer." I managed to get out of writing it by saying that I had nothing new upon that subject. In conversation with him at the State Fair, I stated that I was not quite satisfied with directions and illustrations for training and pruning the grape vine, as published in our last report. He